21718 3 Hours / 100 Marks

Instructions:

- (1) All Questions are *compulsory*.
- (2) Illustrate your answers with neat sketches wherever necessary.
- (3) Figures to the right indicate full marks.
- (4) Assume suitable data, if necessary.

Marks

1. (A) Attempt the following (any THREE):

 $3 \times 4 = 12$

- (a) Define: (i) Chip thickness ratio
 - (ii) Shear angle
- (b) State characteristics of tool material and mention the names of any 2 cutting tool materials.
- (c) State two advantages and two limitations of hydraulic press over mechanical press.
- (d) Explain the terms : (i) Spring back, (ii) Spanking with reference to bending operation.

(B) Attempt the following (any ONE):

 $1 \times 6 = 6$

- (a) Draw a neat labelled sketch of single point cutting tool and show on it all (i) Rake angles, (ii) Cutting angles.
- (b) State the constructional features of extrusion dies. Give name of two components manufactured by extrusion dies.

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2. Attempt the following (any FOUR):

 $4 \times 4 = 16$

- (a) What are the desirable properties of cutting fluids? Give the name of two cutting fluids mentioning its application.
- (b) Give the function of the following components:
 - (i) Pilots

(ii) Misfeed detectors

(iii) Knock out

- (iv) Guide bush used in dies.
- (c) What is ceramic coating of cutting tools? State specific reason of it.
- (d) Define the terms:
 - (i) Tool wear

- (ii) Tool life
- (iii) Machinability
- (iv) Machinability index
- (e) With a block diagram explain working of forging dies.

3. Attempt the following (any TWO):

 $2 \times 8 = 16$

(a) In an orthogonal cutting operation, the following data have been observed.

Uncut chip thickness	t = 0.125 mm
Width of cut	b = 6.40 mm
Cutting speed	v = 2 m/s
Rake angle	$\alpha = 10^{\circ}$
Cutting force	$F_c = 570 \text{ N}$
Thrust force	$F_t = 230 \text{ N}$
Chip thickness	$t_{c} = 0.230 \text{ mm}$

Determine: Shear angle, the friction angle, shear stress along the shear plane and the power for the cutting operation.

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- (b) Explain the process of metal flow during drawing operation with neat sketch.
- (c) Explain the following operation with neat sketch:
 - (i) Notching

(ii) Lancing

(iii) Drawing

(iv) Bending

4. (A) Attempt the following (any THREE):

 $3 \times 4 = 12$

- (a) State two products each manufactured by using (i) Pressure die casting and (ii) Metal forging dies.
- (b) Explain the conditions in which different types of chips are formed.
- (c) State the variables affecting metal flow during drawing operation.
- (d) State procedure to determine the size of a blank for drawing a cup.

(B) Attempt the following (any ONE):

 $1 \times 6 = 6$

- (a) State the tool life equation. State meaning of each term in it. State six variables affecting the tool life.
- (b) With neat sketch explain the clearance given in Die-Punch. State necessity of providing correct amount of clearance on die and punch.

5. Attempt the following (any FOUR):

 $4 \times 4 = 16$

- (a) Explain orthogonal cutting with neat sketch.
- (b) What are the advantages and limitations of compound die?
- (c) Calculate the bending force for channel bending using following data:

Thickness of blank = 3.5 mm

Bending length = 1000 mm

Die radius = punch Radius = 9.5 mm

Ultimate tensile strength of material = 400 N/mm^2

Use K = 0.67 for channel bending.

- (d) State the difference between progressive die and combination die. State the limitations of progressive die.
- (e) Explain oblique cutting with neat sketch.

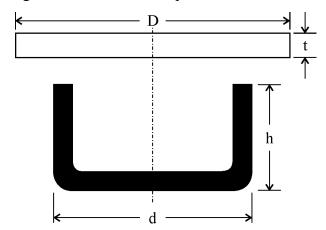
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6. Attempt the following (any TWO):

 $2 \times 8 = 16$

- (a) (i) Define machinability. List the factors on which it depends.
 - (ii) The useful tool life of HSS tool machining Mild Steel at 20 m/min is 3 hours. Calculate the tool life when the tool operates at 25 m/min, assume tool life exponential n = 0.125.
- (b) (i) What is an OBI press? State the function of flywheel in it.
 - (ii) Give the classification of press according to:
 - I. Source of power
 - II. Number of slides/rams
 - III. Method of actuation
 - IV. Type of process
- (c) The figure given below shows a cup to be drawn:



Shell diameter d = 60 mm

Radius of bottom inner corner of shell r = 2.0 mm

Height of cup h = 50 mm

Do not consider trimming of blank.

- (i) Calculate the diameter of blank from it.
- (ii) Calculate the percentage reduction.
- (iii) Calculate number of draws.
- (iv) Radius on punch and die.